



Offshore Wind Power Limited

West of Orkney Windfarm Offshore EIA Report

Volume 1, Chapter 21 - Onshore EIA Summary

WO1-WOW-CON-EV-RP-0037: Approved by S.Kerr

Document Control 18/09/2023

ASSIGNMENT L100632-S05

DOCUMENT L-100632-S05-A-ESIA-021



REVISIONS & APPROVALS

This report has been prepared by Xodus Group exclusively for the benefit and use of Offshore Wind Power Limited. Xodus Group expressly disclaims any and all liability to third parties (parties or persons other than Offshore Wind Power Limited) which may be based on this report.

The information contained in this report is strictly confidential and intended only for the use of Offshore Wind Power Limited. This report shall not be reproduced, distributed, quoted or made available – in whole or in part – to any third party other than for the purpose for which it was originally produced without the prior written consent of Xodus Group and Offshore Wind Power Limited.

The authenticity, completeness and accuracy of any information provided to Xodus Group in relation to this report has not been independently verified. No representation or warranty express or implied, is or will be made in relation to, and no responsibility or liability will be accepted by Xodus Group as to or in relation to, the accuracy or completeness of this report. Xodus Group expressly disclaims any and all liability which may be based on such information, errors therein or omissions therefrom.

A01	08/09/2023	Issued for Review	JG	NB	DB	OWPL
R02	14/07/2023	Issued for Review	JG	NB	DB	OWPL
R01	15/06/2023	Issued for Review	JG	LS	DB	OWPL
REV	DATE	DESCRIPTION	ISSUED	CHECKED	APPROVED	CLIENT



CONTENTS

21	ONSHORE EIA SUMMARY	5
21.1	Introduction	5
21.2	Onshore Project overview	5
21.3	Summary of the Onshore EIA Report	9
21.4	Consideration of Climate, Hazards and Risks	19
21.5	Whole Project assessment	21
21.6	Abbreviations	24



PAGE LEFT INTENTIONALLY BLANK



21 ONSHORE EIA SUMMARY

21.1 Introduction

This chapter summarises the potential effects of the onshore Project to ensure a complete understanding of the Project as a whole. Planning Permission in Principle (PPP) is being sought under the Town and Country Planning (Scotland) Act 1997 for the onshore Project and this is subject to a separate application and Onshore Environmental Impact Assessment (EIA).

At the time of writing, an application for PPP has not yet been submitted and the Onshore EIA Report is currently in preparation. However, the details within this chapter provide the Scottish Ministers and stakeholders with a sufficient overview of the potential effects of the onshore Project at this stage. Once the Onshore EIA Report is submitted to The Highland Council (THC), online copies will be available on the West of Orkney Windfarm¹ and THC² websites and hard copies will be made available for public viewing in specified locations.

21.2 Onshore Project overview

21.2.1 Key components

The onshore Project will comprise:

- Landfall infrastructure landward of Mean Low Water Springs (MLWS) at Greeny Geo and/or Crosskirk, Caithness;
- Up to five Transition Joint Bays (TJBs) at one or across both landfall(s);
- Up to five underground onshore export cables, with each cable comprising three single core power cables and one communication cable, which transmit power as High Voltage Alternating Current (HVAC), underground between the TJBs and the onshore substation;
- One new onshore substation at Spittal;
- Temporary compound areas during construction of the onshore substation, TJBs and installation of onshore export cables;
- Temporary haul road and access tracks during construction and equipment installation; and
- Seven permanent access tracks (indicative at this stage) across the onshore Project area.

The onshore Project area is located in Caithness, within THC jurisdiction and stretches between the potential landfall areas at Greeny Geo and/or Crosskirk and the new onshore substation to the south of Halkirk. The onshore Project area (Figure 21-1) includes the landfall options, onshore Export Cable Corridor (ECC) options and onshore substation search area.

¹ <https://www.westoforkney.com/>.

² <https://wam.highland.gov.uk/wam/>.

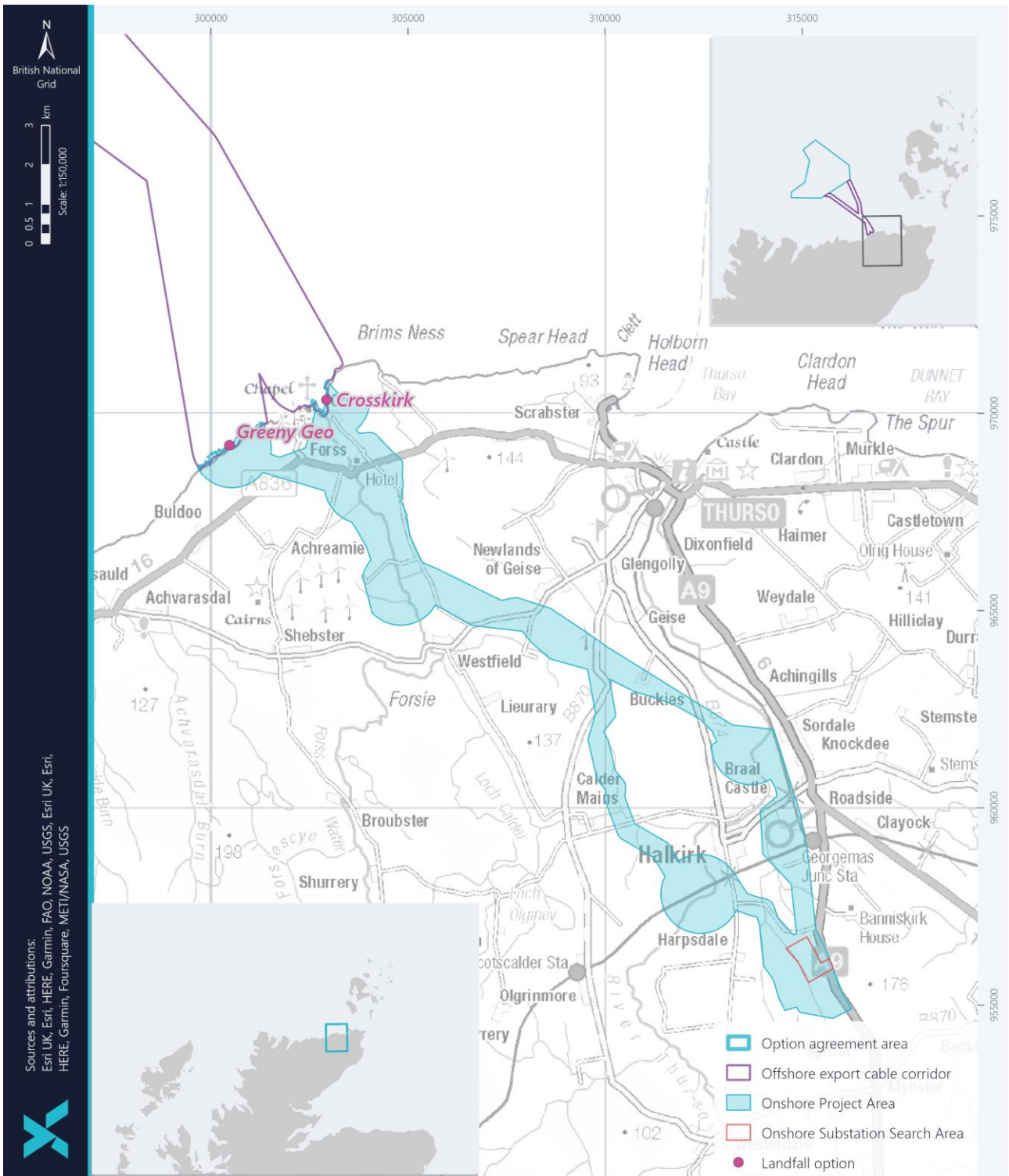


Figure 21-1 Onshore Project area



21.2.2 Construction

It is anticipated that the construction of the onshore Project will take approximately four years (subject to change). The general series of activities is outlined below Table 21-1.

Table 21-1 Outline of onshore construction activities

ACTIVITY	DESCRIPTION
Pre-construction surveys and site investigations	Pre-construction surveys and site investigations may be undertaken, potentially including intrusive archaeological investigations, ecology surveys, hydrology surveys, geotechnical and geophysical surveys, and ground stability surveys. The requirement for these surveys will be determined following the engineering design phase and enforced through post-consent conditions.
Landfall works	<p>The landfall works will involve the following activities:</p> <ul style="list-style-type: none"> • Setting up of a temporary laydown area, Horizontal Directional Drilling (HDD) compound and access tracks for the landfall works; • HDD for landfall installation; • Laying of ducts for later installation of cables; • Construction of TJB's; • Installation and jointing works of onshore and offshore cables to TJB; and • Reinstatement, where necessary.
Cable enabling works	The cable enabling works will be carried out ahead of cable installation and will involve site preparation, including topsoil stripping and fencing off construction areas, setting up temporary work areas, providing main utilities (electrics, water and telecommunications) to service the site and construction of haul roads.
Cable route installation	Following the enabling works, infrastructure to accommodate underground cables will be constructed. The primary method is expected to be open-cut trenching which will involve the excavation of trenches along the cable route. Ducts will be installed, and the habitat reinstated. Construction of Cable Joint Bays (CJBs) are expected alongside the installation of the ducts. Due to the ground conditions present along the onshore export cable corridor, there is potential that rock breaking, battered-back or shored excavations in glacial tills, dewatering systems and shoring in wetter ground condition may be required. After CJBs construction, the onshore cable would be pulled through the ducts. Trenchless crossings will be used to avoid disturbance to sensitive surface features or when crossing linear features (e.g. railway lines and major river crossings).
Onshore substation enabling works	<p>The substation enabling works will involve:</p> <ul style="list-style-type: none"> • Site preparation, earth works (including topsoil stripping, site clearance, and commencement of bund construction), fencing off the construction areas, provision of services to the site and creation of temporary work areas; and



ACTIVITY	DESCRIPTION
	<ul style="list-style-type: none"> • Construction of temporary and permanent access roads and compounds.
Onshore substation civil and electrical works	<p>Following the enabling works, the substation civil and electrical works will commence, which will comprise:</p> <ul style="list-style-type: none"> • Civil works to prepare the site for the heavy-duty equipment required for the installation of the foundations and buildings. This will comprise cut/fill earthworks to create a firm and level platform across the site and bunds creation; • Foundation concrete works for the main electrical components and buildings which may comprise piled and/or shallow foundations; • Construction / installation of the main buildings; • Installation and testing of electrical equipment; • Landscaping works including earthworks / bund landscaping and vegetation planting; and • Commissioning activities.

The West of Orkney onshore works involve three main work areas, these being the landfall HDDs, the cable route from the landfalls to the onshore substation, and the onshore substation which includes interconnection to the Scottish Hydro Electric Transmission Limited (SHET-L) Point of Connection.

The landfall HDD forms part of the offshore works seaward of Mean High Water Springs (MHWS) but the TJB is the interface between the onshore and offshore export cables / works. The TJB will be constructed after the landfall HDD has been completed.

The cable route will be constructed across multiple work fronts due to its length, although at this time it has not been established how many will be developed and over what distance they will be constructed. The work on the onshore cable route will take approximately three years. Careful planning of the onshore cable route works will take place to minimise construction inconvenience to stakeholders and the total duration of any works. Specific transport plans and arrangements will be made with defined access routes and entry / exit points to each of the work faces. After construction of respective sections of the onshore cable route, the cables will be pulled in followed by final reinstatement of the respective route section back to its original condition.

Finally, the works will take place at multiple locations within the onshore Project area, at the landfall, on the cable route and at the substation.

21.2.3 Operation and maintenance

Following commissioning the onshore substation will be unmanned and operate continuously (24 hours a day, seven days a week) except during planned shutdowns for maintenance. The onshore substation will be designed to remain *in situ* during the lifetime of the onshore Project.



There will be a limited amount of traffic to and from the onshore substation for general operation and maintenance purposes, estimated at around one vehicle per week. Apart from this, there will be no day-to-day personnel on site during normal operation.

To allow for the operation and maintenance of the onshore Project, permanent access tracks and improvements to existing roads or tracks are required across the onshore Project area. It is anticipated that six permanent access tracks will be required at HDD sites and one permanent access track will be required at the onshore substation.

21.2.4 Decommissioning

The preferred decommissioning option is for as close to full removal as possible, whilst recognising that this is subject to assessments and consultation closer to the time of decommissioning.

A Decommissioning, Restoration and Aftercare Plan will be required as a planning condition to be approved by the regulator, prior to the onshore decommissioning works. Decommissioning best practice, guidance and legislation will be applied at that time. It is expected that decommissioning will follow a reverse order of the installation activities with some infrastructure potentially left *in situ*.

21.3 Summary of the Onshore EIA Report

The Onshore EIA Report assesses the potential effects of the onshore Project on the receiving environment, including direct, indirect, cumulative, inter-related, whole project assessment and transboundary effects.

The following topics were scoped in for assessment within the Onshore EIA:

- Geology and hydrology;
- Freshwater ecology;
- Terrestrial non-avian ecology;
- Terrestrial ornithology;
- Land use and other users;
- Terrestrial archaeology and cultural heritage;
- Air quality;
- Noise and vibration;
- Access, traffic and transport; and
- Landscape and visual impact assessment (LVIA).

A summary of the assessment of effects presented for each topic-specific assessment of the Onshore EIA Report is provided in the following sections, including an overview of key receptors and a summary of assessment conclusions.

21.3.1 Geology and hydrology

The geology and hydrology assessment evaluates the potential effects from the onshore Project on geology and hydrology receptors such as soils, peat and water environment (groundwater and surface water). The assessment



also characterises the pathways for effects on vulnerable receptors associated with changes in hydrology and ground conditions (e.g. flooding, changes in groundwater flows and/or contamination).

The baseline characterisation for geology and hydrology was informed by a combination of desk-based sources, site-specific surveys conducted between August and October 2022 (walkover surveys and Phase 1 peat surveys), and consultation with the Scottish Environment Protection Agency (SEPA), THC, NatureScot and local landowners. The baseline characterisation characterises the ground conditions and water environment within and in the vicinity of the onshore Project area. Key sensitive receptors include peat deposits within the south of the onshore Project area, two groundwater bodies (classified as having a good overall status), private water supplies (two within the onshore Project area and twelve within 5 km of the onshore Project area), the presence of Ground Water Dependent Terrestrial Ecosystems (GWDTE), and designated sites within or adjacent to the onshore Project area, including Sites of Special Scientific Interest (SSSIs) and Geological Conservation Review (GCR) sites. There is a Scottish Drinking Water Protected Areas (DWPA) at Loch Calder within the study area. However, as this is upstream of the onshore study area no potential impacts are expected from the onshore Project.

The following impacts were identified as requiring assessment:

- Construction:
 - Groundwater flows and levels;
 - Soil compaction and erosion;
 - Changes to soil and groundwater quality;
 - Changes in flow to and/or contamination of vulnerable receptors;
 - Contamination of surface watercourses or waterbodies;
 - Changes to surface water runoff;
 - Risk of flooding to the development and increased risk of flooding in areas downstream; and
 - Interactions with contaminated land.
- Operation and maintenance:
 - Changes to soil and groundwater quality;
 - Changes in flow to and/or contamination of vulnerable receptors;
 - Contamination of surface watercourses or waterbodies; and
 - Risk of flooding to the development and increased risk of flooding in areas downstream.

The assessment considered the embedded mitigation measures including: avoidance of peatland, GWDTE, designated areas, and private water supplies (where possible), minimisation of water crossings and buffer zones which should be maintained in relation to watercourses (where possible), pollution prevention control measures, production of a final Peat Management Plan and final Flood Risk and Drainage Plan once the design of the onshore Project is established following planning consent, and management of contaminated materials.

No significant impacts to any geological or hydrological receptors are predicted, either for the onshore Project or cumulatively with other plans or developments, including any changes in flow or contamination on potentially vulnerable receptors such as public and private water supplies, GWDTE, and the risk of flooding was assessed as negligible. As such there is no requirement for secondary mitigation measures for the onshore Project. Details on the future monitoring proposals for geology and hydrology are not yet known as these will be developed post-consent. However, potential monitoring options could include monitoring of private water supplies, upstream and downstream areas of major watercourse crossings, areas of reinstated peat (if required) and of sensitive habitats or GWDTE.



21.3.2 Freshwater ecology

The freshwater ecology assessment evaluates the potential effects from the onshore Project on freshwater habitats and species (specifically diadromous fish, including Atlantic salmon (*Salmo salar*), brown trout (*Salmo trutta*), European eel (*Anguilla anguilla*) and lamprey species, as well as Freshwater Pearl Mussel (FWPM)). Diadromous fish migrate between freshwater and marine environments as part of their life cycle.

The baseline characterisation for freshwater ecology was informed by desk-based sources and site-specific baseline surveys which were undertaken between May – July 2022. The site-specific surveys comprised of initial reconnaissance surveys to identify important areas for sensitive receptors, followed by a more detailed habitat walkover survey.

The initial reconnaissance surveys showed that habitats for all native fish species and FWPM were present within the freshwater ecology study area encompassing parts of the River Thurso and Forss Water catchments. FWPM were subsequently scoped out due to results of the more detailed habitat walkover surveys as there was no evidence of live mussels or dead shells within the River Thurso or Forss Water catchments.

Suitable spawning habitats for salmonids were found regularly; along with juvenile habitats, and both rivers are functional Atlantic salmon catchments with suitable habitats for brown trout (and any local ecotypes) and eel. The River Thurso is known as one of the best salmon rivers in Scotland and is a Special Area of Conservation (SAC) for Atlantic salmon. The Forss Water catchment is also accessible to migratory salmonids. Habitats for lamprey juveniles were also found, however published information suggests they may be absent from the catchments assessed.

The following impacts were identified as requiring assessment for construction, operation and maintenance, and decommissioning:

- Mortality of important receptors;
- Damage to key freshwater habitats; and
- Interruptions to fish passage.

Consultation with Marine Directorate, NatureScot, THC, Caithness and Northern District Salmon Fishery Boards (DSFBs) and Fisheries Management Scotland (FMS) was conducted to inform the assessment.

No significant effects were identified either for the onshore Project alone or cumulatively with other plans or developments, including effects on high sensitivity receptors such as Atlantic salmon, sea / brown trout, eel and lamprey species. Potential impacts are assessed to be minor or negligible with the appropriate application of the embedded mitigation, and therefore, no secondary mitigation is deemed necessary. Embedded mitigation includes measures to protect sensitive life history timings for salmonids, such as no in-channel working between October and May to protect salmonid spawning, adherence to best practice and regulatory guidance, and prevention of barriers to fish passage. In addition, the use of HDD to install the cables beneath the River Thurso will avoid any direct in channel impacts on the River Thurso SAC.

Once the final onshore Project infrastructure is confirmed during detailed design (post-consent) and specifically once river crossing and other watercourse locations are known an Aquatic Monitoring Plan will be developed.



Finally, in line with NPF4, biodiversity enhancement proposals for the conservation of freshwater ecology receptors are being explored by the Project team. Tree planting is proposed along the Forss Water and River Thurso to increase the amount of shade along these rivers, which is currently very limited, to benefit species such as Atlantic salmon.

Due to the nature of diadromous fish inhabiting both marine and freshwater habitats in their life-cycle, diadromous fish may also be affected by the offshore Project, and this has been considered in the offshore Fish and shellfish ecology assessment. A consideration of the potential interaction between the effects of the onshore and offshore Project is summarised in section 21.4.

21.3.3 Terrestrial non-avian ecology

The terrestrial non-avian ecology assessment evaluates the potential effects from the onshore Project on terrestrial non-avian ecology receptors, such as key habitats and botany, protected species (including otters (*Lutra lutra*), water voles (*Arvicola amphibius*), pine martens (*Martes martes*) and common lizards (*Zootoca vivipara*)), designated sites, and other non-avian species (including deer (*Capreolus capreolus* and *Cervus elaphus*) and badgers (*Meles meles*)).

The baseline characterisation for terrestrial non-avian ecology was informed by a combination of desk-based sources and site-specific surveys, including protected species surveys, Scottish primrose surveys, National Vegetation Classification (NVC) surveys at appropriate times of year between April and September 2022. A deer survey was undertaken in March 2023. Baseline surveys identified a number of key habitats and botany, including Annex I habitats such as coastal grassland and mire communities, GWDTEs, and Scottish primrose; which were ubiquitous within 50 m of the shoreline. It should be noted that the onshore Project area was selected to avoid designated sites wherever possible, with the exception of the River Thurso SAC, where HDD will be employed as outlined in section 21.3.2.

The protected species surveys confirmed the presence of otter, water vole, pine marten, and common lizards, as well as suitable habitats for badgers within the onshore Project area. The presence of roe deer and red deer was also confirmed through site-specific deer surveys. No suitable habitat was identified for red squirrels or great-crested newts.

The following impacts were identified as requiring assessment:

- Construction and decommissioning:
 - Direct habitat loss due to land-take;
 - Indirect impacts upon habitats due to land-take;
 - Disturbance and damage / injury to habitats or protected species;
 - Indirect effects on habitats or protected species (e.g., due to pollution or sedimentation and herbivory by displaced or disturbed deer); and
 - Reduction in deer welfare.
- Operation and maintenance:
 - Disturbance due to maintenance works which are expected to be infrequent and small scale;
 - Indirect effects on habitats and species (e.g. pollution of watercourses as a result of spillage and herbivory by displaced or disturbed deer); and
 - Reduction in deer welfare.



Embedded mitigations proposed include measures to avoid sensitive habitat and species locations, HDD at the landfall(s) to reduce impacts on coastal habitats, habitat reinstatement protocols, pollution prevention control measures and implementation of a Species and Habitat Protection Plan during the project works. An Environmental Clerk of Works will also be present to ensure that these mitigations are adhered to during the activities.

NatureScot were consulted throughout the assessment to agree survey methodologies and to have the opportunity to feedback on survey results. No significant impacts to any terrestrial non-avian ecology are predicted with the application of embedded mitigation, either for the onshore Project alone or cumulatively with other plans or developments, including potential impacts on high sensitivity receptors, such as habitats within designated sites, Annex I habitats, and Scottish Biodiversity List (SBL) priority habitats. All impacts are expected to be negligible or minor and manageable through the implementation of embedded mitigation, such as the avoidance of sensitive areas at sensitive times of the year, presence of an Ecological Clerk of Works (ECOW) and implementation of a species and habitat protection plan, developed post-consent. As such, no requirement for secondary mitigation measures for the onshore Project were identified. No specific monitoring requirements were anticipated. However, future surveys may be conducted to inform the mitigation measures and compensation measures to be developed ahead of construction once the onshore Project design is further refined post-consent.

21.3.4 Terrestrial ornithology

The terrestrial ornithology assessment evaluates the potential effects from the onshore Project on breeding and resident bird assemblages, migratory species overwintering or passing through Special Protected Areas (SPAs) and SSSIs, and designated sites with terrestrial ornithology features (e.g. impacts on nest sites and disturbance to foraging).

The baseline characterisation for terrestrial ornithology was informed by desk-based sources and site-specific baseline surveys, including a range of ornithological surveys (e.g. breeding bird surveys, winter bird surveys, and species-specific surveys). A review of desk-based sources identified nine designated sites (five sites of international importance (SPAs) within 20 km of the onshore Project area and four sites of national importance (SSSIs) within 5 km. Woodland areas were found to be rare in the onshore Project area, and those present are therefore considered to be a key element for birds on site, as they have the potential to support an assemblage of breeding passerine birds. The agricultural landscape in the onshore Project area can also support large numbers of wintering geese and swans. Consultation with NatureScot and Royal Society for the Protection of Birds (RSPB) Scotland was also undertaken during the assessment to agree survey methodologies and to have the opportunity to feedback on survey results.

Several terrestrial avian receptors were identified, which included protected species listed under Schedules 1, 1A, and A1 of the Wildlife and Countryside Act (WCA), geese and swans associated with Caithness Lochs SPA, farmland waders, seabirds, and birds of prey.

The following impacts were identified as requiring assessment:

- Construction and decommissioning:
 - Direct loss of habitat used by birds for nesting, foraging and roosting due to land-take;
 - Disturbance and damage / injury to habitats used by these animals or to individual birds; and
 - Indirect effects on habitats used by birds (e.g., due to pollution or sedimentation).



- Operation and maintenance:
 - Disturbance and damage / injury to habitats used by these animals or to individual birds; and
 - Indirect effects on habitats used by these animals or to individual birds (e.g. due to pollution or sedimentation).

No significant effects are predicted either for the onshore Project alone or cumulatively with other plans or developments, including effects on high sensitivity receptors such as designated sites, breeding seabirds, wintering geese and swans amongst others. Potential impacts are expected to be managed through implementation of embedded mitigation, and therefore, no secondary mitigation is deemed necessary. Key embedded mitigation measures include steps to avoid or minimise the damage to key nesting and foraging habitats and protect key ornithology receptors for the duration of the works (e.g. through seasonal working restrictions to avoid any important geese and whooper swan areas identified in pre-construction surveys between September and mid-May, where possible, and pausing of construction works around any nesting birds, within appropriate buffer distances, until breeding has ended) and to adhere to best practice and regulatory guidance. Pre-construction surveys for bird species and nesting birds will be undertaken to identify any species making use of the onshore Project area ahead of works to ensure disturbance or harm to these species is avoided and felling of trees will be avoided wherever possible. No monitoring is anticipated for terrestrial ornithology receptors.

21.3.5 Land use and other users, including forestry

The land use and other users assessment considers the potential effects from the onshore Project on agricultural land and soils (including peatland), forestry, tourism and recreation assets, and third-party infrastructure.

The baseline characterisation was informed by a combination of desk-based sources and site-specific surveys, including a land use walkover survey, a forestry survey, and deer and peatland surveys. Most of the onshore Project area is comprised of agricultural land. Other key sensitive receptors which form a smaller proportion of the onshore Project area include distinct patches of forestry and woodland, tourism and recreational receptors (e.g. the North Coast 500 scenic road trip route, deer stalking and shooting, and angling), as well as residential receptors and settlements.

The following impacts were identified as requiring assessment:

- Construction and decommissioning:
 - Temporary loss of agricultural land and soils (including peatland);
 - Temporary loss of forestry due to felling;
 - Temporary impacts upon tourism and recreation assets; and
 - Temporary interference with third party infrastructure.
- Operation and maintenance:
 - Long term loss of agricultural land and soils including peatland; and
 - Long term loss of forestry.

No significant effects to land use and other user receptors are predicted for either the onshore Project or cumulatively with other plans or developments. Potential impacts are expected to be manageable with the appropriate application of embedded mitigation, and therefore, no secondary mitigation is deemed necessary. Embedded mitigation includes measures to avoid key sensitive areas, reaching agreements with landowners and recreational service providers, and replantation to mitigate for required felling. No monitoring requirements are anticipated for land use and other users.



21.3.6 Terrestrial archaeology and cultural heritage

The terrestrial archaeology and cultural heritage assessment evaluates the potential effects from the onshore Project on terrestrial archaeology and cultural heritage receptors such as historic environment assets (including cultural heritage assets, such as archaeological remains and historic buildings) and deposits of palaeoenvironmental interest (potentially within areas of peatland).

The baseline characterisation for terrestrial archaeology and cultural heritage was informed by a combination of desk-based sources and site-specific surveys (walkover survey in the summer of 2022, archaeological watching brief in the winter of 2022 during onshore site investigations, and a site visit in March 2023). The initial desk-based study and associated walkover survey of the onshore Project area identified archaeological remains from the Neolithic, Bronze Age, Iron Age, early medieval, post-medieval and modern periods, including scheduled monuments; and historic buildings from the post-medieval and modern periods, including listed buildings, and three scheduled monuments (two prehistoric cairns and a prehistoric hut circle) are located in the vicinity of the new onshore substation indicative location. The archaeological watching brief was maintained on site investigation works, which identified three areas of peat deposits which were of archaeological potential, however no archaeological remains were recorded.

The following impacts were identified as requiring assessment:

- Construction and decommissioning:
 - Loss of or damage to known historic environment assets;
 - Loss of or damage to unknown historic environment assets;
 - Loss of or damage to deposits of palaeoenvironmental or geoarchaeological interest; and
 - Temporary impacts on the setting of onshore historic environment assets that temporarily reduces their value.
- Operation and maintenance:
 - Loss of or damage to known historic environment assets;
 - Loss of or damage to unknown historic environment assets;
 - Loss of or damage to deposits of palaeoenvironmental or geoarchaeological interest; and
 - Long-term impacts on the setting of onshore historic environment assets that reduces their value.

The assessment of effects was informed by consultation with Historic Environment Scotland and the THC Historic Environment Team. This included discussion and agreement on screening to minimise the setting impacts from Achanarras cairns and hut circle. OWPL have committed to avoiding 23 scheduled monuments, listed buildings and non-designated assets of high value during construction of the onshore export cables route (including all scheduled monuments and listed buildings within the onshore Project area). Potential significant effects may arise in relation to effects on a Bronze Age hut circle and an asset of uncertain value during construction and secondary mitigations have been identified to manage these effects, in the form of a staged programme of archaeological evaluation and mitigation. By implementing this secondary mitigation the residual effects have been further assessed as not significant in EIA terms.

Six potential non-significant direct impacts on the remains of post-medieval farm buildings were identified, and a programme of historic building recording as mitigation has been recommended. Three scheduled monuments were taken forward for the assessment of potential changes to setting due to the long term presence of the substation, including two cairns (likely Neolithic) and a Bronze Age hut circle. However, no significant effects relating to these



assets were identified and embedded mitigation will be implemented to reduce the potential for impact on accidental archaeological finds during construction through the implementation of a Written Scheme of Investigation (WSI) and a Protocol for Archaeological Discoveries (PAD). No other significant effects are predicted either for the onshore Project alone or cumulatively with other plans or developments. Any monitoring requirements during construction (including pre-construction) will be detailed in the onshore WSI and PAD, produced post-consent, that is part of the embedded mitigation.

21.3.7 Air quality

The air quality assessment evaluates the potential effects from the onshore Project on air quality receptors, including human receptors, and internationally and nationally designated sites (SACs and SSSIs).

The baseline characterisation was informed by desk-based studies, using available data on air quality in the UK and historical monitoring campaigns to look at the air quality in the onshore study area. The primary focus of the assessment is the generation of dust and other emissions during construction, especially in dry and windy conditions and the potential impacts of this on human health and ecological receptors. Human receptors included multiple residential properties, several non-residential sites and amenity areas. The baseline characterisation also identified several designated sites, including River Thurso SAC and SSSI, Achanarras Quarry SSSI, Ushat Head SSSI, and Loch Lieurary SSSI.

The following impacts were identified as requiring assessment:

- Construction and decommissioning:
 - Dust emissions associated with the onshore Project works; and
 - Dust (onshore export cables installation).

No significant effects are predicted either for the onshore Project alone or cumulatively with other plans or developments. Any dust emissions are anticipated to be highly localised, and the implementation of embedded mitigation measures will reduce the intensity of any impacts experienced. Embedded mitigation includes minimising dust generation and migration from the onshore Project area, ensuring dust pollution at receptors is minimal and ensuring the construction activities on site consider the potential dust generation. No monitoring requirements are anticipated for air quality.

21.3.8 Noise and vibration

The noise and vibration assessment evaluates the potential effects from the onshore Project on sensitive receptors, including human receptors within close proximity of the onshore substation search area.

The baseline characterisation was informed by desk-based studies supplemented by a baseline noise survey undertaken in December 2022. A range of potentially sensitive receptors were identified, including nearby residences to the onshore substation search area.

The following impacts were identified as requiring assessment:



- Construction and decommissioning:
 - Onshore noise associated with construction / decommissioning of onshore components (including vehicle use); and
 - Ground-borne vibration associated with construction / decommissioning of onshore components.
- Operation and maintenance:
 - Onshore noise and ground-borne vibration; and
 - Ground-borne vibration associated with operation and maintenance of onshore components.

The impact assessment has been informed by noise modelling studies to predict the received noise levels at the locations of the sensitive receptors. Potential significant effects were identified for some cases where trenchless (e.g. HDD) cable installation works may require periods of evening and night activity. Appropriate mitigations will be implemented through the CEMP, produced post-consent once the drilling locations are known, to reduce noise and vibration from the onshore Project (e.g. limiting construction activities to core working hours only, where possible). Best practice measures, such as switching off of equipment when not in use will also help to reduce noise and vibration impacts. For operation and maintenance, noise modelling for the onshore substation indicates that noise levels will be of a low magnitude at neighbouring receptors. Embedded mitigations are proposed in the form of a noise control strategy, which will involve the establishment of substation design measures (e.g. specification of low noise plant) that reduce impacts on sensitive receptors, once the final location and design of the onshore substation is known. No other significant effects are predicted for the onshore Project alone or cumulatively with other plans and developments. Monitoring requirements will be determined post-consent but may involve some monitoring of construction noise at noise sensitive receptors during night-time HDD works.

21.3.9 Access, traffic and transport

The access, traffic and transport assessment evaluates the potential effects from the onshore Project on road users, road safety, local communities, and road carriageways.

The baseline characterisation was informed by a combination of desk-based sources and Project-specific on-site Automatic Traffic Counter surveys to calculate current and future baseline traffic flows, and to identify the capacity of the surrounding road network. Key sensitive receptors include multiple road links with low traffic flows and low numbers of Heavy-Goods Vehicle (HGV) movements, meaning that only small absolute increases in traffic as a result of the onshore Project will result in large percentage increases on individual road links. The most sensitive locations in terms of traffic impacts are where roads pass through the more urban areas of Thurso and Halkirk, and on single-track roads where passing opportunities are limited.

The following impacts were identified as requiring assessment:

- Construction and decommissioning:
 - Drive delay;
 - Accidents and safety;
 - Severance;
 - Pedestrian delay and amenity;
 - Dust and dirt; and
 - Impact on road carriageway, verges and associated structures.



The largest traffic impacts are anticipated during the construction stage when the volume of the onshore Project construction traffic will be highest. There may be negligible or minor effects on driver delay, pedestrian delay and amenity, severance, and dust and dirt. In terms of accidents and safety, it was calculated that the onshore Project would result in a non-significant increase in Personal Injury Accidents (PIA). Therefore, no significant effects were identified for these impacts. This will reduce traffic delays for local road users, and for construction vehicles using these routes. Although no significant effects on road degradation were identified as a result of the volume of traffic, it is acknowledged that the roads themselves may have weak verges and be in poor condition, which may lead to degradation. To mitigate these impacts, pre- and post-construction Road Conditions Surveys will be undertaken along all of the construction routes (with the exception of the A9 and A836). These will identify any damage caused by construction vehicles and ensure that the developer is responsible for any repairs. Mitigations and traffic management measures will be implemented through a Construction Traffic Management Plan (CTMP) to be developed post-consent. An outline CTMP is planned to be submitted alongside the Onshore EIA Report.

21.3.10 Landscape and visual impact assessment

The landscape and visual impact assessment identifies and assesses the significance of changes resulting from the construction, operation and maintenance, and decommissioning of the onshore Project on landscape character and amenity.

The baseline characterisation was informed by a combination of desk-based studies and field work survey undertaken within the LVIA onshore study area. The LVIA onshore study area extends 3 km from the onshore Project area and 5 km from the onshore substation. The assessment was informed by desk-based studies and field work based on a defined Zone of Theoretical Visibility³ of the onshore substation, and a proposed height of 13.5 m. To understand the key visual receptors potentially impacted, eight viewpoints were assessed. The extent of the study area and the viewpoints considered were agreed in consultation with THC and NatureScot.

There are no designated landscapes within the study area. The landscape within the study area is vast, exposed and open, generally dominated by a horizontal emphasis. This, as well as the clarity of the air and light, allows for extensive views both within the lowland plain and to the landscapes and seascapes beyond. The undulating landform forms a series of broad, shallow valleys which provides some visual enclosure. Woodland is sparse and limited to small coniferous shelterbelts and clumps of broadleaf trees sheltering farms, but where present, does screen and enclose views.

The impacts of the onshore Project during construction, operation and maintenance, and decommissioning were assessed. The impacts assessed included landscape effects from the onshore substation and onshore export cables on landscape character areas and visual amenity effects of the landfall(s) and onshore export cables on sensitive visual receptors.

³ Zone of Theoretical Visibility is a computer-generated analysis which evaluates visibility. It is not used to determine actual visibility, only theoretical visibility as it does not consider visually significant structures, vegetation and settlements, which may screen or partially obscure views of the onshore substation.



The site selected for the onshore substation is located in an area where there is already a strong influence of this type of infrastructure, including the existing SHET-L substation at Spittal. The iterative design of the onshore substation has been subject to ongoing consultations with THC to understand how the design and layout of the onshore substation in this area could be designed to ensure that the visual effects on receptors are reduced. Although the final substation design is not yet known, several embedded mitigation measures are proposed to reduce visual impacts such as landscape screening, planting and site design (e.g. to 'fit in' better with the existing landscape) that will aim to reduce visual impacts, where possible. The impact assessment took account of these embedded mitigation measures and identified potential significant effects in relation to localised visual impacts on nearby residents, resulting from the introduction of new industrial infrastructure that would replace views of open fields and existing properties or the loss of open views as a result of the introduction of vegetated landscape bunds.

There is no proposed secondary mitigation or monitoring. The embedded mitigations proposed, including landscape bunding as the principle means of screening the onshore substation, with proposed planting to soften the landscape effect, will continue to be refined after planning consent has been granted, in line with ongoing consultations with THC to ensure effects are minimised as far as practicable. Monitoring of landscape and visual receptors will be undertaken through close liaison with affected landowners, asset owners and members of the public, to ensure that local residents are not adversely affected by the onshore Project works.

21.4 Consideration of Climate, Hazards and Risks

21.4.1 Climate and carbon assessment

As required by the EIA regulations⁴, consideration must be made to the "potential impact of the development on the environment resulting from the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change". The Offshore EIA Report is supported by a climate and carbon assessment (Offshore EIA Report, SS1: Climate and carbon assessment). This supporting study considered the Project as a 'whole' including onshore and offshore aspects. The supporting study covered the following:

- Climate resilience review: the vulnerability of the Project to climate change impacts (e.g. increased frequency of storms);
- Carbon assessment: the potential impacts of the Project on climate (e.g. the nature and magnitude of carbon emissions);
- Assessment of effects on biological carbon stores / sequestration: the potential impact of any disturbance or loss of habitats that store or sequester carbon (e.g. peatland, woodland and 'blue carbon' habitats and sediments); and

⁴ the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended), the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) and the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended).



- In-combination climate impact assessment: the potential influence of climate change on the assessment of effects presented within the Offshore and Onshore EIA Reports (i.e. whether any effects from the Project could be exacerbated or reduced by climate change).

The climate resilience review assessed the ability for the Project to withstand projected changes in climate variables that could present a climate hazard or risk (e.g. projected changes in wave height and frequency of storms). Overall, the Project was assessed as being adequately designed to withstand the predicted changes in climate over the operational life of the Project.

The carbon assessment concluded that the Project would make a significant beneficial contribution to the UK carbon budget through the avoidance of more carbon-intensive energy sources. The payback period, the period of time before the Project has avoided more carbon emissions than has been produced by its construction and operation, was estimated to be 8 years. The Project may result in disturbance of biological carbon stores which could result in the release of CO₂ into the atmosphere. However, the prevalence of these types of habitats within the offshore and onshore Project area is considered to be low, as informed by Project-specific surveys, including the offshore benthic surveys and onshore forestry and peat surveys. Any effects on these carbon stores or the future sequestration of CO₂ was assessed as not significant, both for the Project alone and cumulatively with other developments.

The in-combination climate impact assessment identified several impacts which could be affected by climate change. However, in all instances, embedded mitigation measures that are in place to minimise the effects of the offshore Project, such as use of cable burial as the first choice of protection, were considered to adequately manage impacts and no significant effects from the Project, in-combination with the impact of climate changes were identified, and no additional mitigations are required.

21.4.2 Major accidents and / or disasters

Major accidents and disasters have been considered within the onshore EIA Report, specifically those in relation to the health and safety of human receptors and those which pose a risk to the onshore Project. Accidents and disasters such as coastal, fluvial and surface water flood risk, traffic and transport accidents and severe weather events have been considered where relevant when compiling the topic-specific assessments and supporting studies.

It is considered that there is no potential for major accidents and / or disasters to arise from the onshore Project and the onshore Project is not vulnerable to these considered accidents and disasters due to careful design and by adhering to best construction practices, Construction Design Management Regulations and Health and Safety regulations.

All Project risks are considered to be As Low as Reasonably Practicable with the implementation of embedded mitigation measures and no additional mitigation has been identified to reduce risk further at this time. Risk reduction will continue to be refined during detailed engineering design, to ensure that a hierarchy of controls are in place through the various management plans and method statements produced after planning consent has been granted, once the final design of the onshore Project is known.



21.5 Whole Project assessment

A 'whole project assessment' is presented within each topic impact assessment chapter within this Offshore EIA Report. The intention of this assessment is to provide a holistic overview of the effects from both offshore and onshore Project elements, to ensure that the whole Project impacts and effects are understood and that neither the offshore nor onshore Project is considered in isolation.

There is a spatial overlap between the onshore Project and offshore Project boundaries at the intertidal area between MHWS (the extent of the offshore Project boundary) and MLWS (the extent of the onshore Project boundary). It should be noted that no direct effects on the intertidal area from the Project are expected, due to the use of HDD at the landfall. With the use of HDD in the intertidal area, the following chapters identified no pathways for the onshore Project to impact offshore receptors:

- Chapter 8: Marine physical and coastal processes;
- Chapter 10: Benthic subtidal and intertidal ecology;
- Chapter 12: Marine mammals and megafauna;
- Chapter 13: Offshore and intertidal ornithology;
- Chapter 14: Commercial fisheries;
- Chapter 15: Shipping and navigation;
- Chapter 16: Marine archaeology and cultural heritage; and
- Chapter 17: Military and aviation.

The chapters that identified pathways for the onshore Project to impact offshore receptors are listed in Table 21-2, and an appraisal of the potential interaction between the onshore and offshore Project effects is provided. In all instances, no significant effects from any additional impacts from the onshore Project are expected. It should also be noted that the assessment of effects in chapter 19: Socio-economics and Supporting Study 1 (SS1): Climate and carbon assessment considers the Project as a whole, inclusive of both the onshore and offshore Project.



Table 21-2 Conclusions of the whole Project assessment presented within each topic-specific chapter

OFFSHORE TOPIC	WHOLE PROJECT ASSESSMENT	RELEVANT ONSHORE REPORT ASSESSMENT	EIA
<p>Chapter 9: Water and sediment quality</p>	<p>The onshore Project has the potential to overlap with the Forss Water and River Thurso catchments which drain to the Strathy Point to Dunnet Head and Thurso Bay designated coastal waterbodies. The Forss Water and River Thurso are currently listed in 'Good' overall status, and as described in chapter 9: Water and sediment quality, the Strathy Point to Dunnet Head and Thurso Bay coastal waterbodies are also in 'Good' overall status. Impacts from the onshore Project to these surface waters could result in changes to the water quality status of the designated coastal waterbodies into which they drain; however, this will be mitigated using standard embedded mitigation measures (e.g. standard best practice mitigation to avoid sedimentation and pollution) and in line with any planning conditions and/or licences issued under the Controlled Activities (Scotland) Regulations 2005 (CAR). The onshore Project will undertake HDD operations above MHWS, with an HDD exit point offshore within the offshore Export Cable Corridor (ECC). Therefore, there will be avoidance of works in the major watercourses (e.g., River Thurso) through the use of HDD. Furthermore, the use of temporary bridges or n-shaped culverts rather than pipework will be used in watercourses where appropriate for the haul roads as provided in the Onshore EIA Report chapter 9: Freshwater ecology.</p> <p>The impacts within the offshore ECC on water and sediment quality receptors has been assessed in full in chapter 9: Water and sediment quality and there are considered to be no significant effects. It is not anticipated that there will be any additional impacts from the onshore Project on water and sediment quality receptors. Therefore, the potential for effects between the onshore and offshore Projects activities on water and sediment quality receptors is expected to be minimal and no significant effects are anticipated.</p>	<p>Geology and hydrology</p>	<p>and</p>
<p>Chapter 11: Fish and shellfish ecology</p>	<p>The onshore Project will undertake HDD operations above MHWS, with an HDD exit point offshore. The impacts from the HDD exit point on fish and shellfish ecology receptors have been assessed in full in chapter 11: Fish and shellfish ecology. It is not anticipated that there will be any additional impacts from the onshore Project on fish and shellfish ecology receptors within the marine environment as all other activities from the onshore Project are fully terrestrial.</p> <p>The onshore Project may potentially impact diadromous fish that have life history strategies that utilise the freshwater environment (e.g. damage to freshwater habitats or interruptions to fish passage). Effects on freshwater ecology will be mitigated using standard embedded mitigation measures (e.g. standard best practice mitigation to avoid sedimentation and pollution) and in line with any conditions issued under the planning permission in principle and/or licences issued under CAR. Therefore, the potential for effects are expected to be low and no significant effects are expected to arise.</p>	<p>Freshwater ecology</p>	



OFFSHORE TOPIC	WHOLE PROJECT ASSESSMENT	RELEVANT ONSHORE REPORT ASSESSMENT
<p>Chapter 18: Seascape, landscape and visual assessment</p>	<p>There are no potential effects on visual amenity associated with both the presence of the onshore substation and the offshore Project, as there are no locations where it is possible to see both the offshore Project and the substation at the same time.</p> <p>There is a spatial overlap between the offshore Project and the onshore Project at the landfall. It is possible that offshore Project construction (presence of construction and cable lay vessels) would be visible concurrently with construction activities at the landfall. Any effects would be short term, localised and temporary in nature during construction only. Construction of the offshore export cable will have limited influence on seascape, landscape and visual receptors due to the temporary nature of above sea construction processes. The activities mainly occur from vessels, which are already an apparent component of the baseline seascape and views. Effects of construction of the cable landfall at Crosskirk and/or Greeny Geo are assessed within the Onshore EIA Report for the Landscape and visual impact assessment. The offshore cables will be located below the sea surface and will not be visible as part of the seascape or views once operational. Therefore, the offshore cables will have no operational effect on seascape, landscape and visual receptors.</p>	<p>Landscape and visual impact assessment</p>
<p>Chapter 20: Other sea users</p>	<p>The works for the onshore Project could disturb the onshore activities associated with the other sea users receptors described within chapter 20: Other sea users, such as marine recreation and tourism activities at the coast, the decommissioning works at Dounreay NPDE and Vulcan NRTE, and the construction works for the SHET-L Caithness to Orkney HVAC Link. However, it is expected that any disturbance from the onshore Project will be mitigated in a similar manner to any disruption from the offshore Project (e.g. through consultation with relevant parties ahead of any onshore works and seeking agreements on procedures to reduce the potential for any disruption). Therefore, considering the localised and temporary nature of any disruption associated with both the onshore and offshore Project, there is no potential for the onshore Project to exacerbate any of the effects assessed within this chapter.</p>	



21.6 Abbreviations

TERM	DEFINITION
CAR	Controlled Activities (Scotland) Regulations 2005
CEMP	Construction Environmental Management Plan
CJB	Cable Joint Bay
CTMP	Construction Traffic Management Plan
dB	Decibel
DSFB	District Salmon Fishery Board
DWPA	Drinking Water Protected Area
ECC	Export Cable Corridor
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
FMS	Fisheries Management Scotland
FWPM	Freshwater Pearl Mussel
GCR	Geological Conservation Review
GWDTE	Ground Water Dependent Terrestrial Ecosystems
HDD	Horizontal Directional Drilling
HGV	Heavy-Good Vehicle
HVAC	High Voltage Alternating Current
LVIA	Landscape and Visual Impact Assessment



TERM	DEFINITION
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
NVC	National Vegetation Classification
OWPL	Offshore Wind Power
PAD	Protocol for Archaeological Discoveries
PIA	Personal Injury Accidents
PPP	Planning Permission in Principle
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SBL	Scottish Biodiversity List
SEPA	Scottish Environment Protection Agency
SHET-L	Scottish Hydro Electric Transmission Limited
SPA	Special Protected Area
SSSI	Sites of Special Scientific Interest
THC	The Highland Council
TJB	Transition Joint Bay
WCA	Wildlife and Countryside Act
WSI	Written Scheme of Investigation